

REMARKS

Review and reconsideration of the Office Action of July 1, 2005, are respectfully requested in view of the above amendments and the following remarks.

Claims 1-5 are canceled.

Claims 6-12 are pending in the application and are rejected under 35 U.S.C. 103(a) as being unpatentable over Kinsman et al. (U.S. Patent 5,814,784) in view of Baessler et al. (U.S. Patent 5,567,335).

Office Action

Turning now to the Office Action in greater detail, the paragraphing of the Examiner is adopted.

Specification

The Examiner objects to the abstract of the disclosure because it contains more than one paragraph and is too long. Correction is required.

A new abbreviated Abstract is submitted herewith.

The Examiner indicates the disclosure is objected to because of the following informalities: claim numbers are in the specification.

The specification has been revised to remove reference to claim numbers.

Claim Rejections - 35 U.S.C. § 103

Claims 6 and 10-12 are rejected under 35 U.S.C. 103(a) as being obvious over Kinsman et al. (U.S. Patent 5,814,784) in view of Baessler et al. (U.S. Patent 5,567,335).

According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time of the invention to use preheats with the above percentage differences as taught by Baessler et al. in the Kinsman et al. process because this optimizes the welding speed and increases manufacturing efficiency.

Applicants respectfully traverse.

First, it is noted that claims 7-9 are not rejected under this paragraph. Claim 6 has been amended to recite that for thermal treatment of the plate the laser beam is guided over the surface of the plate prior to and/or after welding. This clearly distinguishes over Kinsman et al teaching use of laser to heat a tool, followed by (a) contacting the hot tool to a surface for heat treatment of the surface by conductive heat transfer, which is a slow method of heat transfer, or (b) not contacting, and thus using heat irradiation, which is an extremely slow method of heat transfer.

Turning now to a discussion of the generic differences between Kinsman et al and the present invention, Kinsman et al teach that it is difficult to couple laser radiation to reflective metals. Energy is reflected and the energy transfer rate is low. As energy input is increased to compensate, the occurrence of major faults such as cracks, undercuts, inclusions, etc increases. To prevent these problems Kinsman et al teach the **indirect** introduction of energy, using an ancillary system which acts to efficiently absorb laser energy, and then transfer the heat energy to the work surface. The ancillary system is preferably a tool, which is heated by the laser, then contacted to the work surface to heat the work surface to produce physical, chemical or metallurgical changes in the work surface.

Accordingly, Kinsman et al teach a comparatively complex and slow system for introduction of heat, which does not take into consideration that metal sheets being welded must be clamped, and for introduction of heat by such an ancillary tool must be unclamped and reclamped numerous times.

The system of Kinsman et al is no better than the system of inductive heating discussed at paragraph [0003] of the present specification, which is also described as requiring elaborate additional setup, as providing low flexibility with respect to seam geometry, and as requiring adaptation of clamping or setting requirements to meet changed requirements.

The present invention concerns a process which is characterized by

- low apparatus complexity,
- minimum processing time, and
- flexibility of workpiece geometry,
- while achieving good prevention of loss of ductility in metal sheets

Kinsman et al does not meet the first requirement since there is a requirement for an auxiliary tool for absorbing and then transmitting heat.

Kinsman et al certainly does not meet the second requirement - transfer of thermal energy by conductivity is extremely slow compared to laser radiation.

The third requirement is also obviously not met - the workpiece geometry and clamping arrangement must be designed and staged to accommodate the pressing of a tool against and along the surface of the workpiece. This is complex, bulky, slow, and very limited in application.

The fourth requirement may be met by Kinsman et al. However, while the benefits of heat treatment are known, and

while crude methods for achieving heat treatment are known, what was missing from the prior art and what is provided by the present invention is the rapid thermal treatment of a plate, with great flexibility in shape and setup, and with minimum complexity of apparatus.

Accordingly, Kinsman et al may well exemplify the state of the art, but Kinsman et al provide no suggestion for the present invention.

Turning now to the present invention as defined in the claims, it will be seen that the present invention was not completed upon simply deciding to use the laser to weld plus pre- or post-heat treat. The use of laser to accomplish the heat treatment was not easily accomplished. For the invention to be successful, it was necessary to carry out much experimentation, and the invention was completed only after discovering that success could be ensured by:

separating welding and thermal treatment timewise from each other in such a manner that the temperature reduction of the respective illuminated surface from the point in time of the first illumination to the point of the subsequent illumination is less than 50%, and

adjusting the laser energy input, based on the illuminated surface area and time, by defocusing the laser beam and/or increasing the rate of advance in such a manner that the side of the existing or to-be-formed weld seam opposite to the laser beam is warmed by at least 10°C.

Kinsman et al provides no suggestion as to how to accomplish the present invention.

Turning to the secondary reference to see whether this remedies the deficiencies in Kinsman et al, Applicants do not find sufficient teaching.

Baessler et al teaches pre-heating of sheet metal edges by, e.g., high frequency excitation, to reduce temperature gradients during welding and increase welding speed.

Baessler et al teaches at col. 2 line 21 that the edges to be welded should contain 5-40%, preferably 10-15%, of the thermal energy necessary for welding.

Accordingly, Baessler et al does not teach a two step process involving (a) welding and (b) a pre- or post-treatment process, with separating welding and thermal treatment timewise from each other.

Further, Baessler et al do not teach that the two steps are carried out in such a manner that the temperature reduction of the respective illuminated surface from the point in time of the first illumination to the point of the subsequent illumination is less than 50%.

In particular, Baessler et al does not teach application of laser to a two step process wherein the laser is used for both the pre- or post-treatment process and the welding process.

Accordingly, withdrawal of the rejection is respectfully requested.

Next, Claim 7 (laser beam guided via scanner device) is rejected under 35 U.S.C. 103(a) as being obvious over Kinsman et al. and Baessler et al., as stated above and further in view of Totsuka et al. (USPN 5,303,081).

According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time of the invention to use scanning, as taught by Totsuka et al. in the Kinsman et al. and Baessler et al. process because of the enhanced strength of the weld seam.

Applicants respectfully traverse.

Kinsman et al teaches **AGAINST** use of laser for heat treatment. Kinsman et al teach that the inefficiency of laser treatment of reflective metal, and the loss of quality problems associated with laser treatment of metal, can be overcome by use of an ancillary tool which is designed to efficiently absorb laser energy, and which tool is then either contacted with or positioned near the work surface for slow conductive or radiative heating of the work surface. This is contrary to the simple and rapid thermal treatment process of the present invention. To modify Kinsman et al by replacing the ancillary tool of Kinsman et al with direct laser of Totsuka et al. would destroy the teaching of Kinsman et al.

Turning to Totsuka et al, while this reference teaches a scanner type laser with pivoting mirror suitable for welding or annealing objects, Totsuka et al is concerned with a device, not a process for welding of sheets, which process is particularly suited for welding metal such that the product exhibits minimum loss in ductility of the metal.

Withdrawal of the rejection is respectfully requested.

Next, Claim 8 (defocused laser beam) is rejected under 35 U.S.C. 103(a) as being obvious over Kinsman et al. and Baessler et al., as stated in the above and further in view of Cutler (USPN 6,706,998).

According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a focal distance, as taught by Cutler in the Kinsman et al. and Baessler et al. process because this is merely one of the standard operating parameters.

Applicants respectfully traverse.

The present invention is characterized by a two step process involving (a) welding and (b) a pre- or post-treatment

process, with separating welding and thermal treatment timewise from each other, wherein the two steps are carried out in such a manner that the temperature reduction of the respective illuminated surface from the point in time of the first illumination to the point of the subsequent illumination is less than 50%.

Thus, a reference teaching defocusing of a laser is not sufficient to reach the present invention.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kinsman et al. and Baessler et al., as stated in the above and further in view of Chang (USPN 4,230,930).

According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a defocus distance, as taught by Chang et al. in the Kinsman et al. and Baessler et al. process because this is merely one of the standard operating parameters.

Applicants traverse the rejection of claim 9 for the same reasons set forth with respect to claim 8.

Next, Claims 6 and 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Uchiumi (JP 63-43788 abstract) in view of Baessler et al. (USPN 5,567,335).

According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time of the invention to use preheats with the above percentage differences as taught by Baessler et al. in the Uchiumi process because this optimizes the welding speed and increases manufacturing efficiency.

Applicants respectfully traverse.

Uchiumi teaches coating a steel board 1 with a coating material 3 for absorbing laser light. The parts 1,2 being welded are preheated with a defocused laser beam 4, followed by welding in an area having no coating 3.

Baessler et al teaches at col. 2 line 21 that the edges to be welded should contain 5-40%, preferably 10-15%, of the thermal energy necessary for welding.

Accordingly, the application of the percentage difference of Baessler et al to the welding process of Uchiumi does not render obvious the present claim limitation that the temperature reduction of the respective illuminated surface from the point in time of the first illumination to the point of the subsequent illumination must be less than 50%.

Accordingly, withdrawal of the rejection is respectfully requested.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uchiumi and Baessler et al. as stated above and further in view of Totsuka et al.

According to the Examiner it would have been obvious to one of ordinary skill in the art at the time of the invention to use scanning, as taught by Totsuka et al. in the Uchiumi and Baessler et al. process because of the enhanced strength of the weld seam.

Applicants submit that this combination of references does not reach the present claim limitations. Further, claim 7 is allowable by virtue of it's dependency from an allowable claim.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Uchiumi et al. and Baessler et al., as stated in the above and further in view of Cutler.

According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a focal distance, as taught by Cutler in the Uchiumi and Baessler et al. process because this is merely one of the standard operating parameters.

Applicants submit that this combination of references does not reach the present claim limitations. Further, claim 8 is allowable by virtue of it's dependency from an allowable claim.

Claim 9 is rejected under 35 U.S.C. 103(a) as being obvious over Uchiumi et al. and Baessler et al., as stated in the above and further in view of Chang et al.

According to the Examiner, it would have been obvious to one of ordinary skill in the art at the time of the invention to use a defocus distance, as taught by Chang et al. in the Uchiumi and Baessler et al. process because this is merely one of the standard operating parameters.

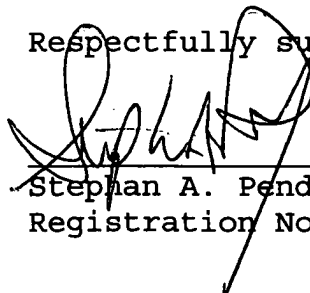
Applicants submit that this combination of references does not reach the present claim limitations. Further, claim 7 is allowable by virtue of it's dependency from an allowable claim.

The Examiner considers the prior art made of record and not relied upon pertinent to Applicants' disclosure.

Applicants have reviewed these references and have no further comments.

Applicants believe that all the claims are now allowable. Favorable consideration and early issuance of the Notice of Allowance are respectfully requested. Should further issues remain prior to allowance, the Examiner is respectfully requested to contact the undersigned at the indicated telephone number.

Respectfully submitted,



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AMENDMENT A

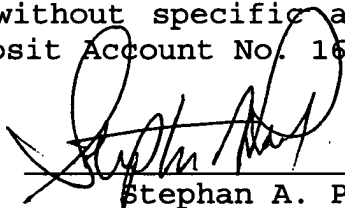
Attorney Docket No.: 3926.070

CERTIFICATE OF MAILING AND AUTHORIZATION TO CHARGE

I hereby certify that the foregoing AMENDMENT A for U.S. Application No. 10/790,383 filed March 1, 2004, was deposited in first class U.S. mail, with sufficient postage, addressed: Mail Stop Amendment, Commissioner of Patents and Trademarks, P.O. Box 1450, Alexandria, VA 22313-1450, on **January 3, 2006**.

The Commissioner is hereby authorized to charge any additional fees which may be required at any time during the prosecution of this application without specific authorization, or credit any overpayment, to Deposit Account No. 16-0877.




Stephan A. Pendorf